

REMARKS

Reconsideration of the application is respectfully requested, if view of the following remarks.

To make even clearer the nature of the discrete frozen confections, the minimum average volume mentioned at line 21 of page 9 of the specification (0.02 ml) has been introduced into claim 1. Claim 1 has also been amended to make clearer the nature of the confections by incorporating subject matter from the first paragraph of page 9 of the specification.

The present invention is directed to a frozen confectionery product comprising a plurality of discrete water ice confections, each being able to contact directly other discrete water ice confections, which water ice confections comprise an ice structuring protein (ISP) having at least 6 wt% solids, an average volume of less than 1 ml and a minimum average volume of 0.02 ml. As pointed out in the specification, the frozen confections may, for example, be in the form of beads. Although the present invention is not so limited, it may be helpful to point out an example of the type of product at issue, namely the recent product innovation of single serve containers filled with a plurality of water ice beads. This is pointed out not to read any limitations into the claims but to help the Office picture the type of product which is a discrete water ice confection able to contact directly other discrete water ice confections in the product.

The specification points out that if the solids content of water ice beads is above about 6 wt%, the beads are too soft and tend to stick together. The specification indicates on page 2 that applicants have discovered that the addition of ice structuring proteins to frozen water ice products reduces their tendency to stick and allows the production of

free flowing confectionery products which maintain their free flowing characteristics for longer and at higher storage temperatures.

The Office points to the teaching by Fenn et al. of frozen confectionery products having an average ice crystal size preferably from 5 to 15 microns. This should be contrasted with the recited minimum average volume of at least 0.02 ml. The Office points to no teaching by Fenn et al. of the particle sizes recited, i.e., of the type of product at issue herein, or of the problem to which the present invention is directed, no less its solution.

Claim 1 has also been amended to indicate that the water ices are able to move relative to each other. This further emphasizes the nature of the product, for example, beads.

Lilliford et al. US Patent No. 6,162,789 mentions in column 4 that AFP's in accordance with the invention provide an ice particle size following an ice recrystallization inhibition assay of 15 microns or less, preferably from 5 to 15 microns. In column 9, it is stated that especially preferred are sample sizes providing ice crystals of 15 microns or less, although a few larger crystals (up to 20.3 microns) are reported in the table in Example VII. Applicants submit, then, that Lilliford is not leading one of ordinary skill to discrete water ice confections, each discrete water ice confection being able to contact directly other discrete water ice confections in the product having an average volume of less than 1 ml and a minimum average volume of at least 0.02 ml.

Applicants enclose a copy of Arbuckle, "Ice Cream," Fourth Edition (Chapman & Hall, New York), pp 42-43. Arbuckle discloses specific gravity of ice cream mixes which should give the Office a reasonable basis for concluding that the 10 g single portions of Lilliford will not have a volume close to 1 ml. Even if water ice were so dense as to

have a specific gravity of 1.601 (solids other than fat), the volume would only be approximately 6 ml which, of course, is much larger than 1 ml.

Applicants are unclear as to what aspect of page 6, line 22 the Office is suggesting for inclusion in the specification instead of incorporation by reference. It would be appreciated if the Office would clarify if it still feels this is a potential issue.

In view of the foregoing, it is respectfully requested that the application be allowed.

Respectfully submitted,



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ICE

CREAM

Fourth Edition

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CHAPMAN & HALL
New York • London

freezing. The fat globules begin to agglomerate due to the agitation and concentration of freezing; when observed with the microscope, the agglomerates begin to look like bunches of grapes. The rate of agglomeration and coalescence is a function primarily of the degree of agitation, but also is affected by such factors as protein stability, melting point of the fat, temperature of the freezer, emulsifier, stabilizer, sugars, and salt content.

Dryness in ice cream is directly correlated with emulsion instability, and the greatest dryness and stiffness is obtained in ice cream where the maximum amount of fat clumping has taken place short of actual churning. As ice cream is manufactured under lower freezing temperatures and with longer agitation periods, a greater degree of fat destabilization is exhibited.

To summarize recent research, dryness and stiffness are primarily due to the agglomeration of the butterfat globules. It has been shown that this agglomeration of fat results in a slower meltdown, due perhaps to its greater resistance to flow. In the light of recent findings, we may consider fat agglomeration during freezing as being beneficial, particularly in the case of the continuous freezer.

If agglomeration is carried too far, as might be the case with the extended agitation received in the soft-serve freezer, the result will be eventual churning, with the production of visible butter chips. The negative charges carried by the fat globules, which cause them to repel each other, are lost or overcome during the agitation. An ideal ice cream would be one in which all of the fat is agglomerated but in which none has churned out as visible butter chips. Ice cream in this condition would possess optimum properties of texture, body, dryness, and stiffness as well as an improved apparent richness.

The agitation of colder and stiffer ice cream mix causes more rapid churning, contrary to the belief held by some that a longer initial freezing time leads to increased churning. In fact, at the higher temperatures associated with longer initial freezing, churning takes place much more slowly.

Certain emulsifiers tend to destabilize the butterfat, thus accelerating churning. Fat emulsion destabilization is indicated when there is a poor meltdown, i.e., the ice cream does not melt to a smooth consistency but retains much of its original shape or structure even after it has been exposed to room temperature. The reduction of freezing temperature results in a drier product with a greater amount of destabilized fat, and consequently an increased tendency toward the churning of the fat; a similar problem exists in the soft-serve industry, where a dry stiff product is desired.

Results of a survey of commercial ice cream have shown that ice cream sandwiches manufactured under conditions regulated to extrude a dry product have approximately three times the amount of destabilized fat as ice cream frozen under conditions where dryness is not of particular importance.

The factors affecting fat stability in chocolate ice cream include homogenization, pressure and temperature, type of chocolate product, acidity, emulsifier, corn syrup solids, and calcium and phosphate salts.

Density of Mixes

The specific gravity or density of ice cream mix varies with composition. The specific gravity may be measured by a hydrometer or by weighing a known

volume of mix at a known temperature on a gravimetric balance. We can also calculate the specific gravity for a mix at 60°F (15.6°C) by the formula

100

$$\frac{[\text{fat } (\%)/0.93] + [\text{sugar, MSNF, stabilizer } (\%)/1.58] + \text{water } (\%)}{100}$$

Wolf used a value of 1.601 for the solids other than fat, which will give a value approximately 0.0026 higher than the 1.58 factor. Investigations indicate that specific gravity of the mix may vary from 1.0544 to 1.1232.

Acidity of Mixes

The normal acidity of mix varies with the percentage of MSNF; it contains and may be calculated by multiplying the percentage of MSNF by the factor 0.018. Thus, a mix containing 11% MSNF would have a normal acidity of 0.198%. The normal pH of ice cream mix is about 6.3.¹ The acidity and pH are related to the composition of the mix—an increase in MSNF raises acidity and lowers the pH. The acidity and pH values for mixes of various MSNF content are given in Table 4.4.

If fresh dairy products of excellent quality are used, the mix can be expected to have a normal acidity. The normal or natural acidity of ice cream mix is due to the milk proteins, mineral salts, and dissolved gases. Developed acidity is caused by the production of lactic acid by bacterial action in dairy products. When the acidity is above normal it indicates that developed acidity is present in the dairy products used in the mix. A high acidity is undesirable as it contributes to excess mix viscosity, decreased whipping rate, inferior flavor, and a less stable mix, resulting in "cook on" or possible coagulation during the pasteurizing and processing procedure.

Influence of Mineral Salts

The influence of various mineral salts on the properties of ice cream has been studied by many investigators. In the past, these studies have concentrated on the effects of such materials on acid standardization of the ice cream mix.

The use of various mineral salts in ice cream has also been considered from the standpoint that some of these materials help to control churning and separation of the fat in the mix during the freezing process and impact the desired stiffness, smoothness, or other characteristics to the finished ice cream, claims made by industry representatives. Studies on the effects of sodium and magnesium phosphates, calcium and magnesium oxides, and sodium bicarbonate have shown that they tend to improve the flavor, body and texture, and general characteristics of the finished product.

Calcium and magnesium oxides or carbonates are recommended in preference to the sodium products because sodium's strong wetting effects counteract

¹A neutral substance (i.e., neither acidic nor alkaline) would have a value of 7.0, with decreasing values indicating increasing acidity.